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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/587,971	03/05/2007	Masashi Tsuboi	294569US8PCT	7115

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OBLON, SPIVAK, MCCLELLAND MAIER & NEUSTADT, L.L.P.  
1940 DUKE STREET  
ALEXANDRIA, VA 22314

EXAMINER
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PERROMAT, CARLOS

ART UNIT	PAPER NUMBER
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2628

NOTIFICATION DATE	DELIVERY MODE
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07/19/2010

ELECTRONIC

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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<b>Office Action Summary</b>	<b>Application No.</b> 10/587,971	<b>Applicant(s)</b> TSUBOI ET AL.	
	<b>Examiner</b> Carlos Perromat	<b>Art Unit</b> 2628	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 23 June 2010.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-9 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-9 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |   |   |
|---|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)                    | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____                                      |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)         | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____   | 6) <input type="checkbox"/> Other: _____                          |

## DETAILED ACTION

### *Remarks*

The Examiner mostly agrees with the Applicant's representation of what took place in the interview of May 28<sup>th</sup>, 2010. The Examiner stands corrected with respect to the date of the interview. The Examiner however does not feel that the Examiner's recollection of the interview differs from that of the Applicant, except that the Examiner did not suggest an RCE, as stated by the Applicant. The Applicant inquired on whether the proposed amendment would be entered after final, and the Examiner communicated that it would not be, since it changed the scope of the claim. That the Applicant understands from this that the Examiner suggested an RCE is a misinterpretation. Indeed, the Examiner presented to the Applicant the opinion that the claims as presented in the tentative amendment would be obvious over the prior art, either cited or already found by the Examiner, therefore discouraging the Applicant from said filing.

### *Response to Arguments*

1. Applicant's arguments filed 6/23/2010 have been fully considered but they are not persuasive.

At page 7, the Applicant argues that Payne is directed to positioning exit pupils within the system, which requires no moving parts. The Applicant justifies this position on the basis of a plurality of portions within Payne. The Applicant proceeds to cite: "[p]riority is **given to calculating and displaying the part of the display corresponding to the contributing region.**" The Applicant then cites "the control means **determines the range of angles** that sub-regions of the display means must

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direct light into **to contribute to the image formed for the at least one viewing position and the pixel values of the display** means are calculated such that priority is given to directing light into said range of angles." Finally, the Applicant cites "the bandwidth (range of spatial frequencies) of the fringes and coded into each hogel (holographic element) would be determined by the limited range of angles that each hogel is required to direct light into for a given viewer position". The Applicant therefore concludes that Payne is directed to adjusting an angular range of a contributing region based upon monitoring the eye of the observer. First the Examiner notes that even in the Applicant's cited portions of Payne, Payne states explicitly that the invention calculates a region of the display. The Applicant seems to believe that because Payne does this by modifying the angles of the pixel element, this disqualifies the method as calculating the region. The examiner disagrees, and respectfully states that the Applicant's arguments do not take into account what is known in the art, and even disclosed by the Applicant. The examiner points the Applicant to page 1 of the specification, lines 14-20: "'Holography' has been known as a three-dimensional image display technique. Holography is a technique of reconstructing the optical wavefront of object light coming from an object as a three-dimensional image by **irradiating illuminating light onto a display device on which a control image (an interference pattern of light in which phase or amplitude** is controlled) is recorded". This is the basis of holography. The Applicant will notice that by this description of what is the very basis of holography, that which can be controlled is either phase or amplitude. Phase **is an angle**. Further, lines 21-26 teach: "There is a known holographic method in which a

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'kinoform' constituted by the phase distribution of an optical wavefront for modulating the phase of irradiated light is used. This method supposes that in a control image recorded on a display device, **the amplitude of the optical wavefront is constant and only the phase of the optical wavefront** is distributed". While the Applicant explicitly teaches that the method of performing holography used in the invention is based on the phase control of a control image, which is an angle. Finally, at page 8, lines 15-25 the Applicant states that each pixel in the kinoform takes a value from 0 to  $2\pi$ , and that the control of the image is performed by applying a voltage for each pixel. Why the Applicant insists to point out that Payne does not teach any moving parts is not understood, unless the Applicant is suggesting that the claimed invention refers to holography through physical rather than electronic means (which would not be holography and would make the references to control images and pixels incomprehensible in light of the specification) or that Payne does not teach a machine that performs holography, that is, that although Payne explicitly teaches that "[t]he present invention relates to reconfigurable three-dimensional displays and particularly to displays utilizing Computer Generated Holograms (CGH). The invention provides a means of minimizing the computation time required to generate a Computer Generated Hologram (CGH)". The Examiner submits that the Applicant's point of view that Payne does not teach any "moving parts" either misrepresents the claimed invention as some sort of non-electronic machine, or misrepresents Payne as magically producing holograms without circuitry or "moving parts". The insistence that Payne modifies the angle of incidence of the pixel as somehow different from what the Applicant does is

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also not based in either what is known in the art or even what the Applicant's invention does: "In the three-dimensional image display device according to this embodiment illuminating light irradiated from the illuminating light irradiating unit 30 is **phase-modulated within a range of 0 to  $2\pi$**  by the pixels on the kinoform 20C recorded on the display device 20A, and **the phase-modulated illuminating light reaches the reconstructed image display unit 40 through the Fourier lens 20B, changing its direction of propagation, whereby a three-dimensional image corresponding to a control image is displayed**". Even within the claims, claim 4 explicitly teaches that the region to be calculated is based on the range in which phase modulation is possible. As pointed out, phase modulation is the modification of the angle of the light. Even when amplitude modulation is used rather than phase modulation it is the angle of the resulting light that is used for determining the area (see page 23, lines 18-22). The Examiner respectfully concludes that the Applicant's arguments have no technical basis, either in the art or even by the Applicant's own disclosure, and respectfully disagrees with the arguments.

2. Applicant's arguments with respect to claims 1-9 have been considered but are moot in view of the new ground(s) of rejection.

The Examiner considers that Payne, although not explicitly teaching the claim limitations as amended does indeed suggest to one of ordinary skill the amended limitation, as further discussed below.

***Claim Rejections - 35 USC § 103***

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 1-9 are rejected under 35 U.S.C. 103(a) as being unpatentable over the applicant's admitted prior art (p.1, lines 14-29, p.2, lines 1-29, p.3, lines 1-29 and p. 4, lines 1-10 of the specification of the instant application; "AAPA" hereinafter) in view of Yoshikawa et al. (N. Yoshikawa and T. Yatagai; "Phase Optimization of a Kinoform by Simulated Annealing"; Applied Optics, Vol. 33, No. 5; February 1994; supplied by the applicant; "Yoshikawa" hereinafter), and further in view of Payne et al. (U.S. patent Publication No. 2004/0021768; "Payne" hereinafter).

Regarding claim 1, AAPA teaches a three-dimensional image display device for displaying a three-dimensional image by irradiating illuminating light at an optical wavefront control unit which records a control image (p. 1, lines 1-20), comprising: a control image optimizing unit configured to calculate three-dimensional images corresponding to a group of control images, select a control image corresponding to the three-dimensional image satisfying a predetermined condition from the group of control images, and record the selected control image on the optical wavefront control unit (see p. 2, lines 2-29 and p. 3, lines 1-4 for a thorough description of the Simulated Annealing method which consists on the steps described).

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AAPA does not teach that the constraints are information regarding the optical wavefront unit. Yoshikawa however discloses a method of optimizing phase of a kinoform using a Simulated Annealing method such as that described in AAPA (see Introduction, 2<sup>nd</sup> and 3<sup>rd</sup> par. for Simulated Annealing) where the kinoform is optimized to adjust to the characteristics of the optical control medium (see Introduction, 3<sup>rd</sup> par.; see Section 4, 3<sup>rd</sup> par. for using the modulation characteristics of the control unit in order to improve irregularities obtained when this characteristic is not considered). Because both AAPA and Yoshikawa teach devices that optimized a kinoform using the Simulated Annealing method, it would have been obvious to one of ordinary skill in the art at the time of the invention to use the display characteristics of the display unit when performing Simulated Annealing optimization for the reasons disclosed by Yoshikawa and discussed above.

AAPA and Yoshikawa teach that the predetermined condition is information regarding an optical wavefront control unit (see discussion above for using the modulation characteristics of the control unit). AAPA and Yoshikawa do not explicitly teach the predetermined condition is also a condition restricting a region to be calculated of a three-dimensional image of each pixel of a control image recorded in the optical wavefront control unit on a control image basis, where the region to be calculated is a region of the three-dimensional image affected by change of a pixel on the optical wavefront unit.

Payne however teaches a three-dimensional display in which calculations are minimized by taking into account only the range of angles that cause an effect (see



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abstract; see par. [0033]; see par. [0093] for using this limitation in calculation by determining the originating elements in the control device that affect a region and further speeding calculations by limiting the range of angles that each holographic element is required to direct light into). Since Payne teaches reducing calculations by processing only data relevant to an appropriate output region, and AAPA teaches the computational intensity of the Simulated Annealing method (see p. 2, line 29 and p.3 lines 1-5), it would have been obvious to one of ordinary skill in the art to use the association of control elements and output region taught in Payne with the Simulated Annealing method taught in AAPA and Yoshikawa in order to reduce calculations to the portions of the image affected by each iterative change, as taught by Payne; the examiner further notes that it is very well-known in the art that each image element is considered a pixel (a picture element), and also, from the discussion above, that simulated annealing requires calculations on a control image basis. While Payne limits the region that is to be calculated to the region that would be visible to a specific viewer, see par. [0093], par. [0004] clearly shows that it is known in the art to perform calculation based on the angle of view for a specific viewer or alternatively, for a plurality of viewers. Therefore, since Payne teaches limiting the calculations for each pixel in the image on the basis of the effect the pixel has on the image as seen by a user, but also teaches that it is known in the art to perform calculations for images that need to be seen by a plurality of users, it would have been obvious to one of ordinary skill in the art at the time of the invention faced with the challenge of optimizing computation as taught by Payne for an image to be seen by a plurality of users of positions unknown to limit the calculation for each pixel

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on the basis of the changes the pixel makes on the image as seen by any possible spectator, thereby limiting the calculation for each pixel to the region of the 3D image affected by the pixel as seen from any possible or predictable viewer.

Regarding claim 2, AAPA, Yoshikawa and Payne further teach that the control image optimizing unit is configured to generate the group of control images by sequentially performing change processing on part of the control image, and sequentially calculate the three-dimensional images based on difference information about the control images before and after the change processing (in AAPA, see p. 2, lines 2-5 and p. 3, lines 1-5).

Regarding claim 3, AAPA, Yoshikawa and Payne do not explicitly disclose that the control image optimizing unit is configured to calculate the three-dimensional image in a region to be calculated defined by the constraints. Payne however teaches a three-dimensional display in which calculations are minimized by taking into account only the range of angles that cause an effect (see abstract; see par. [0033]; see par. [0093] for using this limitation in calculation by determining the originating elements in the control device that affect a region). Since Payne teaches reducing calculations by processing only data relevant to an appropriate output region, and AAPA teaches the computational intensity of the Simulated Annealing method (see p. 2, line 29 and p.3 lines 1-5), it would have been obvious to one of ordinary skill in the art to use the association of control elements and output region taught in Payne with the Simulated Annealing method taught in AAPA and Yoshikawa in order to reduce calculations to the portions of the image affected by each iterative change, as taught by Payne.

Regarding claim 4, AAPA, Yoshikawa and Payne further teach that the control image is constituted by phase distribution of an optical wavefront (in AAPA, see p. 1, lines 21-26); and the control image optimizing unit is configured to calculate the region to be calculated, based on a range in which phase modulation is possible on a display device constituting the optical wavefront control unit, and accuracy of the phase modulation (see discussion for claims 1, 2 and 3 above; in Yoshikawa, see Fig. 7 for the phase modulation and discussion above to account for this effect).

Regarding claim 5, AAPA, Yoshikawa and Payne further teach that the control image optimizing unit is configured to calculate the region to be calculated, also taking account of amplitude modulation which occurs with the phase modulation (see discussion for claims 1, 2 and 3 above; in Yoshikawa, see Fig. 7 for amplitude modulation, and discussion above to account for this effect).

Regarding claim 6, AAPA, Yoshikawa and Payne further teach that the control image is constituted by amplitude distribution of an optical wavefront; and the control image optimizing unit is configured to calculate the region to be calculated based on a range in which amplitude modulation is possible on a display device constituting the optical wavefront control unit, and accuracy of the amplitude modulation (see discussion for claims 1, 2 and 3 above; in AAPA; see p. 1, lines 14-20 for controlling either phase or amplitude distribution. Although the Simulated Annealing method is discussed with respect to phase distribution the Examiner notes that the method only describes a pseudo-random optimization method to solve computationally difficult problems by using progressively narrow tolerances, and that it would have been obvious to one of ordinary

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skill in the art at the time of the invention to use such method to adjust amplitude in the same manner as adjusting phase; Yoshikawa, see Fig. 7, for amplitude and phase modulation).

Regarding claim 7, AAPA, Yoshikawa and Payne further teach that the control image optimizing unit is configured to calculate the region to be calculated also taking account of phase modulation which occurs with the amplitude modulation (see discussion for claims 1, 2 and 3; in Yoshikawa, see Fig. 7 for amplitude and phase modulation).

Regarding claim 8, AAPA, Yoshikawa and Payne teach a three-dimensional image display method for displaying a three-dimensional image by irradiating illuminating light at an optical wavefront control unit which records a control image comprising: calculating three-dimensional images corresponding to a group of control images based on constraints inherent to the optical wavefront control unit; selecting a control image corresponding to the three-dimensional image satisfying a predetermined condition from the group of control images; and displaying the selected control image on the optical wavefront control unit, wherein the predetermined condition is information regarding an optical wavefront control unit and a condition restricting a region to be calculated of a three-dimensional image of each pixel of a control image recorded in the optical wavefront control unit (see discussion for claim 1, above).

Regarding claim 9, AAPA, Yoshikawa and Payne further teach that the region to be calculated defined by the constraints is calculated is calculated for each pixel of an initial solution (see discussion for claim 1 for AAPA teaching simulated annealing as

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conventional, see AAPA page 2, lines 2-29 and page 3, lines 1-5; see discussion above for taking into account the modulation capabilities of the control unit, and see Payne, par. [0093] for speeding up calculations by using the limited angle ranges for each holographic element for speeding up calculations).

### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Carlos Perromat whose telephone number is (571) 270-7174. The examiner can normally be reached on M-TH 8:30 am- 5:00 pm EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kee M. Tung can be reached on (571)272-7794. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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C.P.